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ABSTRACT

The Fairfax County, Virginia, Schools' Primary Mathematics Program (PMP) was re-evaluated to provide additional data on program effectiveness and to provide suggestions on future program development, implementation, and improvement. Seventy-one teachers in 14 schools implemented the pilot program. Evaluative data included interviews with 14 principals, teacher surveys, observations of student and teacher behavior, and California Achievement Tests scores of second grade PMP students versus those in 61 classrooms in 14 comparison schools. Results indicated that teacher and principal attitudes toward PMP were positive. Expected behaviors were confirmed as far as teaching strategies, use of instructional and manipulative materials, and student behavior. Although teachers and principals felt that PMP children had greater understanding of mathematics concepts than comparison groups, the PMP students' achievement levels on the California Achievement Tests were the same as their counterparts in the comparison classrooms. Factors which were found to impede program implementation were student evaluation procedures, PMP ability to meet the needs of advanced students, and teacher time required for lesson planning and management of materials. Facilitative factors included program developers' assistance, teacher training, integration of textbooks and manipulative materials, and colleagues' support. Most principals favored the expansion of PMP to include grade 3. Various evaluation instruments and results are appended. (GDC)

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EXECUTIVE SUMMARY:

REPORT OF THE 1983-84 EVALUATION OF THE PRIMARY MATHEMATICS PROGRAM

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PURPOSES OF THE EVALUATION

The 1983-84 evaluation of the Primary Mathematics Program (PMP) was a continuation of the initial evaluation begun in 1982. The major purposes of this year's study were to obtain additional data for the longitudinal study of program effectiveness and to provide useful information for future program development, improvement, and implementation. Specific evaluation questions included:

1. What are teachers' and principals' attitudes toward the program?
2. Are expected teacher and student behaviors observable in PMP classrooms?
3. Are there differences in the way PMP teachers and teachers not in the PMP use manipulatives and textbooks?
4. How does mathematics achievement of students in the PMP compare with that of students who are not in the program?
5. What recommendations can be made regarding future program development, dissemination and delivery?

PROCEDURES

In order to answer the five evaluation questions, procedures and instruments were developed by the Office of Research and Evaluation to examine the attitudes of teachers and principals, describe current classroom implementation and assess student achievement. Major procedures used in PMP and comparison schools are described below.

- Interviews with all 14 PMP principals.
- Survey of PMP teachers to assess their attitudes toward the program.
- Collection of self-report data from PMP teachers to describe their use of assessment strategies and program components.
- Collection of information regarding students' use of manipulatives and textbooks from written lesson descriptions provided by pilot and comparison group teachers.
- Observations in a sample of classrooms in each PMP school.
- Achievement testing of second grade students in PMP and comparison schools (California Achievement Tests).
- Informal data collection.

SUMMARY AND CONCLUSIONS

In general, teachers piloting the PMP are very supportive of the program as a strategy for teaching mathematics. They have a positive attitude toward the materials, activities and teacher training. Principals concur that the PMP provides an educationally sound approach to teaching youngsters and appear even more enthusiastic about the program this year than last.

This generally positive reception can be attributed, in part, to the success of teacher inservice training provided by its developers. This inservice training is not only viewed as thorough, relevant and of high quality; but it has provided direct support to teachers, an important aspect in implementing a new program.

PMP teachers appear to be implementing the program strategies as prescribed, using textbooks, manipulatives, and other program materials. The behaviors of students and teachers that one would expect to occur in these classrooms, do indeed occur, and these behaviors are somewhat different than what one would find in other classrooms. Although program and non-program teachers, alike, use both textbooks and manipulatives to reinforce student learning, those using PMP strategies rely more on manipulatives and less on textual materials to introduce and develop concepts. As the PMP is still in the initial phases of implementation, most teachers are following lesson plans very closely. It is possible that, as they become more experienced and comfortable with the program, they will use the materials more flexibly, adapting them to a wide range of student achievement levels.

Teachers and principals alike believe that children in the program develop a greater understanding of mathematics concepts and that they are more motivated to learn. They consider these to be important advantages of PMP and attribute them to the "hands-on" activities the children experience before moving to the abstract level. At present, achievement test scores neither confirm nor dispute this belief. Students in the PMP demonstrate the same achievement levels on the California Achievement Tests as their counterparts in the comparison classrooms. This is not to say that actual differences in their proficiency do not exist. The discrepancy between teaching and testing styles may accentuate student difficulties in this type of testing situation. It is possible that these students might perform even better on a test which is able to assess their actual levels of mathematics concept development. Unfortunately, no tests are currently available which are considered to be adequate indicators of mathematical concept development in young learners. On the other hand, it remains a possiblity that the results of norm-referenced testing may reveal group differences in later grades.

Some factors have been identified which might impede program implementation. These include the procedures for evaluating students, the ability of the program to meet the needs of advanced learners, and the time required for lesson preparation and management of materials. Teachers' attitudes toward these factors appear to be associated with program experience. Those with more experience with the PMP are less likely to consider them problematic.

Factors which seem to facilitate implementation of the program were also

identified. These include the assistance provided by the program developers, the quality of the teacher training, the integration of the textbook and manipulatives, and the support of teachers and the Department of Instructional Services.

Most principals feel the program would be appropriate through grade three, and favor expansion into a larger number of schools. When considering possible future expansion into other schools, principals stressed the need for voluntary participation, communication of program goals and philosophy, continuation of the flexible integration of textual materials and manipulatives, continuation of teacher training, and the timely delivery of program materials.

RECOMMENDATIONS

The cooperation of principals and teachers enabled the evaluation team to collect valuable information resulting in the following list of recommendations. It is hoped that these recommendations prove useful in future program development and improvement.

1. Consider expanding the existing first and second grade program to additional schools on a voluntary basis.

2. Consider expansion of the program to grade three if ample time for preliminary development can be provided before piloting in a small number of schools.

3. Continue to integrate textual materials with manipulatives in a way which allows teachers flexibility in adapting the program to the needs of their students.

4. Continue inservice training for teachers new to the program. Provide less intensive training for experienced PMP teachers.

5. Involve experienced PMP teachers in the training of those new to the program.

6. Streamline the teachers' guide to make it less cumbersome and easier for teachers to use.

7. Refine student evaluation strategies to make them less time consuming and easier to administer.

8. Provide teachers with specific strategies for classroom management and for teaching combination classes and advanced learners.

9. Utilize suggestions provided by teachers at this year's inservices as revisions are made to the second grade program; continue to solicit and respond to teachers' suggestions for program improvement.

10. Develop and implement a plan for communicating program philosophy, goals and objectives to parents, teachers and administrators.

11. Continue the longitudinal study of mathematics achievement begun in 1982-83.

REPORT OF THE 1983-84 EVALUATION OF THE PRIMARY MATHEMATICS PROGRAM

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Department of Instructional Services
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August 1984

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DESCRIPTION OF THE PRIMARY MATHEMATICS PROGRAM

Goal

The Primary Mathematics Program (PMP) represents a philosophy and approach to the teaching of mathematics with the ultimate goal of fostering greater understanding of basic concepts and operations. It is a manipulative-based program designed to be used with the Program of Studies (under revision) and adopted textbooks. The program developers define a manipulative as "something a child can hold and talk about" which is used in a manner which fosters understanding.

Components

The philosophy and goals of the PMP are supported by several components, most of which were developed specifically for this program.

- A teacher's manual (a looseleaf binder) which provides for each unit of instruction: daily lesson plans, Program of Studies objectives, a list of materials needed, assessment inventories, reinforcement and enrichment/extension activities, and lesson plans for substitutes.
- Assorted manipulatives such as Unifix cubes, base-ten blocks, geo-boards, counters, geometric shapes, and links in quantities sufficient for all students.
- Student booklets which provide work space and writing space for problem solving, experimentation, and practice.
- Mathematics basal textbooks, adopted by Fairfax County.
- Inservice sessions conducted by the developers to explain the theory, organization, and application of the program.

Instructional Strategies

The present program is designed to be used with children in the first and second grade. The original teaching strategy was total group instruction, allowing for individualization of response in the total group and differentiated assignments. However, teachers can adapt it to small-group instruction.

The PMP classroom, as defined by the program developers, should be characterized by certain specific teacher and learner behaviors.

The teacher:

- Uses a teaching sequence which requires (a) teacher modeling with manipulatives, (b) students working with manipulatives, and (c) teacher and/or students writing.
- Asks open-ended questions and questions in which the child draws upon personal experiences and classroom experiences to develop mathematical concepts.

- Interacts with the children beyond "checking" work.
- Moves around the classroom to monitor and assess student work.

The child:

- Uses manipulatives every day.
- Makes a written record of experiments resulting from manipulative experiences.
- Verbalizes what he/she does with manipulatives (as opposed to "playing" with manipulatives).
- Offers multiple responses to open-ended questions.
- Draws upon personal experiences and classroom experiences in developing mathematical concepts.
- Uses the textbook.

PURPOSE OF THE EVALUATION

In September 1982, the Assistant Superintendent for Instructional Services requested that the Office of Research and Evaluation (ORE) review and evaluate the PMP which was being piloted in fourteen elementary schools. Critical issues related to the program were identified by the evaluation team and program developers in order to provide information which might facilitate decision-making regarding continuation and possible expansion of the PMP to other elementary schools. The results of the 1982-83 evaluation provided much in the way of formative information for program development as well as baseline data for a longitudinal study. Following this study, the decision was made to limit the size of the pilot to fourteen schools, allowing for the continuation of the first grade program as well as the development and piloting of a second grade program in these schools. In addition, the first grade teacher's guide was revised and textual materials were integrated with PMP.

Again at the request of the Assistant Superintendent for Instructional Services, ORE continued its evaluation during 1983-84 for the purposes of obtaining additional data for the longitudinal study of program effectiveness and providing useful information for future program development, improvement, and implementation. The focal points of this investigation were attitudes of teachers and principals, current classroom implementation, student achievement, and suggestions for future program delivery and dissemination. Specific questions addressed include:

1. What are teachers' and principals' attitudes toward the program?
2. Are expected teacher and student behaviors observable in PMP classrooms?
3. Are there differences in the way PMP teachers and teachers not in PMP use manipulatives and textbooks?

4. How does mathematics achievement of students in PMP compare with that of students who are not in the program?

5. What recommendations can be made regarding future program development, dissemination, and delivery?

SCHOOLS IN THE STUDY

Seventy-one teachers in the following 14 schools implemented the pilot program during the 1983-84 school year: Bren Mar Park, Centreville, Clermont, Fort Hunt, Franklin Sherman, Freedom Hill, Haycock, Kings Park (grade 1 only), Layton Hall, Lemon Road, London Towne, Oakton, Rose Hill, and Wakefield Forest. Two schools in the 1982-83 pilot, Chapel Square and Wood, closed at the end of the year. Chapel Square students now attend Wakefield Forest. Wood students now attend Layton Hall, which continues as a pilot school. Kings Park began implementation this year in first grade classes only.

Sixty-one classrooms in the following 14 non-pilot schools continue to serve as a comparison group for the evaluation: Chesterbrook, Crestwood, Fairhill, Fairfax Villa, Hollin Meadows, Kent Gardens, Mantua, Markham, Marshall Road, North Springfield, Shrevewood, Sleepy Hollow, Stratford Landing, and Washington Mill. These schools were randomly selected from the total group of Fairfax County Public Schools (FCPS) which had 1982 Metropolitan Readiness Tests (MRT) mean scores closest to the MRT mean score of the pilot group.

EVALUATION PROCEDURES

Some data collection procedures and instruments used for this evaluation are similar to those used in the 1982-83 evaluation. Others are new because additional information was needed to answer this year's evaluation questions. In cases where instruments were revised or newly developed, the evaluation team was in close contact with program developers and teachers.

Interviews with Principals

The role of principal allows a unique perspective on the implementation of any new instructional program. This school-level viewpoint provides information not available elsewhere and insight into the determining factors of a program's success or failure. With the importance of the principal's perceptions and attitude in mind, all of the 14 principals whose teachers use PMP were interviewed.

Each of these interviews took approximately 30 minutes and was conducted by a member of the evaluation team during February and March of 1984. Principals were asked to describe how PMP was used at their schools and to comment on a variety of topics during the structured interview which allowed for open-ended responses. These topics included:

- Opinions about PMP strategies, materials, and teacher training.
- Perceptions of the teaching staffs' ability to maintain the program in the future.
- Perceptions of how staff members have dealt with program modifications.
- Opinions regarding program support.
- Attitudes toward program expansion.

A copy of the principal interview questions is located in Appendix A.

Teacher Questionnaire

The teacher questionnaire developed by ORE has three major sections: a survey of teacher attitude toward the program, a teacher self-report, and a mathematics lesson description. Each of these sections is discussed separately, and a copy of the complete questionnaire appears in Appendix B.

Survey of Teacher Attitude

Successfully implementing an innovative program requires careful attention to the beliefs, needs, and opinions of those who are expected to utilize the program daily. For this reason, an attitude survey was developed which would allow all teachers using PMP an opportunity to express their opinion about the general worth of the program and about various aspects of its implementation.

All 71 of the program teachers were sent a copy of the survey. They were asked to record their reactions to 26 statements, using a five-point Linkert-type scale which ranged from strongly disagree to strongly agree. Teachers were also asked to indicate the grade they teach, number of years in the program, and the number of inservice programs they attended during the current school year. The number of surveys returned was 69, yielding a response rate of 97%.

Results of a factor analysis indicated that categorizing the 26 attitude items into two scales was a reasonable approach. The general worth scale contained 12 items addressing the value of PMP as a teaching-learning strategy. The 14-item implementation scale addressed the adequacy of the teacher inservice training, the appropriateness and utility of the program materials, and the relative ease of implementing the program in the classroom. Reliability estimates for the two scales are .91 for worth of the program and .75 for implementation. These estimates indicate that the reliability of the scales is sufficiently high to draw conclusions about teacher attitude and make recommendations based on the survey results.

Teachers were also asked to respond to four open-ended questions about the program. The questions focused on perceived advantages and disadvantages of the program and areas of needed improvement. All but one of 69 teachers who returned the survey completed this open-ended section.

Teacher Self-Report

An additional 13 items on the questionnaire were used to ascertain teachers' use of assessment strategies and various components of the program such as the teacher's guide, textbook and student booklets. Of specific interest in the self-report were the types of assessment strategies employed, the frequency with which the major components were used and the degree of modification of these components.

Description of Most Recent Mathematics Lesson

The third section of the questionnaire was administered to teachers in both the PMP and comparison groups. This component required teachers to describe the most recent mathematics lesson taught in their classrooms. This section was designed to collect information regarding student use of manipulatives and textbooks in the pilot and comparison classrooms and to provide a context for comparing the results of these two groups on the norm-referenced test.

Sixty-nine of the 71 teachers in the PMP pilot schools completed this part of the questionnaire. One description was not usable because it was incomplete. All 61 teachers in the comparison schools responded to the questionnaire. Seven of these responses were not usable because they were incomplete or completed incorrectly.

Classroom Observations

The PMP Classroom Observation Form is a structured instrument which was used by trained observers to record types of modifications made to PMP lesson plans, evaluation opportunities and special learning situations which occurred during PMP lessons, classroom management strategies, and student understanding of mathematics concepts demonstrated during the lessons.

This observation tool was developed over a period of several months. Initially, meetings were held with program developers to identify essential elements of the PMP which could be observed and recorded. Several observation formats were developed and field-tested in PMP classrooms throughout FCPS. A series of discussions were held with teachers, program developers, and evaluation team members following each of the field test efforts. The observation instrument was then pilot-tested and a few minor revisions were made. The instrument and accompanying instructions are included in Appendix C.

One first grade and one second grade PMP classroom were randomly selected in each of the PMP schools (N=27). Combination grades were also included in the sample but the observation focused on either the first or second grade lesson. From the 27 completed observations (14 first grade, 13 second grade) a total of 25 were usable. Two of the observations were not included because they were conducted as part of training and were considered to be incomplete.

Three former FCPS elementary teachers, all with primary classroom experience, were trained to conduct the structured observations. During the

initial training session, observers were given an overview of PMP goals and philosophy, as well as an in-depth look at PMP lesson plans and materials. Issues in conducting observations and instructions for completing the observation instrument were thoroughly discussed. Demonstration and practice in completing observations was given during lessons conducted by the program developers. Each observer then conducted two observations in the sampled PMP classrooms, while accompanied by an evaluation team member. The observer and the trainer completed separate observation forms and compared the results in discussions immediately following the observations. After each observer had completed two of these sessions, their observations were found to be complete and in agreement with those of the trainers. Each observer then conducted all remaining observations alone.

Teachers in each of the randomly selected classrooms were notified one week before the observation and asked for their weekly math schedule. They were told of the nature of the observation but were given no specific date. All teachers cooperated willingly in the study.

Observers arrived one-half hour before the scheduled math session to become accustomed to the specific classroom setting and to review the scheduled lesson as presented in the teacher's guide. Observations were recorded during the lesson. Each part of the lesson was compared with the instructions for that lesson part in the PMP lesson manual. Any modifications, additions or deletions to that part of the lesson were recorded. A separate observation form was completed for each part of the lesson. Lesson parts were defined by the PMP manual and included such things as teacher demonstration, student experimentation, and review and practice. Additional relevant observations were made about classroom seating and unusual or unclear situations. Completed observation forms were returned directly to the ORE for analysis.

Completed observation forms were obtained for 53 lesson parts from 25 classrooms. This included 13 first grade and 12 second grade classrooms. There were 25 lesson parts in first grade classes and 28 in the second grade.

Achievement Testing

During the first year of the evaluation, the program developers and the evaluation team reviewed several standardized tests for use in the evaluation. The California Achievement Tests (CAT), Level 11, Form C, Computation and Concepts/Applications subtests were selected because they appeared to be valid and reliable measures of mathematics achievement and because PMP objectives were included to the extent that they are measurable by a standardized test. However, there was some concern about this test's ability to measure concept development. The search has continued for a more appropriate instrument; but, to date, it appears that there is nothing available which adequately assesses mathematics concept development in young learners. Therefore, in this second year of the evaluation, the program developers and the evaluation team agreed to use Level 12, Form C of the CAT. This test was determined to be the most appropriate test available for the needs of the evaluation and one that would best lend itself to the longitudinal study.

All second grade students in the PMP and comparison groups took the Computation and Concepts/Applications subtests of the CAT mathematics battery during the week of March 5-9, 1984. The testing period was selected to coincide with the mandated testing programs. Although tests were scored for 1363 students, the analysis of scores is based on a matched group of 595. Only those students who were part of last year's study and who took both mathematics subtests this year were included in the analysis group for 1983-84. This was done to ensure that conclusions regarding mathematics achievement of PMP students are based on pupils who have been in either the pilot program or comparison schools throughout the first and second grades and to permit the application of multiple analysis of covariance techniques. The covariate in the analysis was the kindergarten Metropolitan Readiness Tests (MRT) total battery composite.

List reports providing student names and national percentile equivalents for Computation, Concepts/Applications, and total mathematics scores were generated for each class tested and sent to the schools participating in the study. School level data was not aggregated. Scores for PMP and non-PMP students were matched with the data file from 1982-83.

At the time of testing, teachers of both groups were asked to identify the content and/or learning processes which they felt were not adequately measured by the CAT. Of the 34 PMP teachers polled, 19 teachers representing 8 schools responded. Of 33 non-PMP teachers, five teachers representing three schools responded. A copy of the questionnaire appears in Appendix D.

Informal Data Collection

In addition to the formal data collection procedures described in this section, additional information was obtained through meetings with principals, teachers, program developers, an outside consultant, and central and area staff. Members of the evaluation team attended most of the teacher inservice sessions provided by the program developers. Attendance at these sessions enabled the team to talk informally with teachers, determine relevant questions to address through data collection instruments, and identify important issues relevant to PMP. Attendance at meetings with principals and central and area personnel was also helpful in instrument development and identification of issues.

RESULTS

The findings of the study are reported in a descriptive manner. Schools are not isolated or identified in reference to any particular comments or achievements. Comparisons are limited to student use of manipulatives and textbooks and to academic achievement as shown by the California Achievement Tests (CAT). These comparisons are generalized between the group of schools piloting PMP and a group of non-PMP schools.

Interviews with Principals

Interviews with the principals of the 14 PMP schools provided a rich data base. To facilitate reporting, this information has been organized into the following categories:

- Program efficacy
- School-level implementation
- Program support
- Program expansion
- Recommendations of principals

Principals' comments concerning each of these areas are summarized below. A copy of the interview questions is located in Appendix A.

Program Efficacy

All principals said that PMP is a program for teaching mathematics in the primary grades. Some described it as "outstanding," "excellent," or "the best." Only one principal expressed a qualified judgment, believing that although it is a good approach for some children, the program may move too slowly for others. Nearly everyone interviewed felt that students in the program learn as much as they would using another approach and over half thought students learn more with PMP. Principals were very supportive of the program's concrete approach to mathematics and stressed that students gain a better understanding of concepts and have a strong foundation for later learning. While nearly all principals are enthusiastic about the program, it is evident that some principals feel even more positive about the program now than they did at this time last year. Specific reasons cited for their increased enthusiasm include the:

- Integration of textual materials.
- Belief that the program is more cohesive this year.
- Quality and usefulness of the teacher inservice training.
- Level of teacher enthusiasm.
- Degree to which the Department of Instructional Services listened and responded to their needs.

When questioned about program materials, most principals said they felt that the materials for teachers were adequate and those for students appropriate. They believed that the manipulative materials were especially useful and appreciated having these materials provided, as it takes a lot of time for teachers to produce their own manipulatives. Principals found few problems with the adequacy of teacher materials. A few cited the teacher's manual as particularly helpful, while others found it wordy or unclear.

School-Level Implementation

Each principal was asked to describe how PMP was used in his/her school. With the exception of Kings Park Elementary School, which began the program this year in first grade only, all first and second grade teachers are implementing the program, including those who teach combination classes. Beyond this general pattern, there seems to be a variety of ways in which the program has been adapted to meet specific school needs. Some schools are using aides, volunteers, student tutors, and/or the assistant principal to work with students in the program. A few principals reported that PMP is used in a math-lab setting, as well as in the regular classroom. All principals reported that teachers use both manipulatives and a textbook. Some saw the focus on manipulatives, while others saw these two program components being used about equally. Little difference between first and second grade implementation was reported by principals.

In an effort to identify factors which may either facilitate or impede the implementation of PMP, principals were asked to cite any particular aspects of the implementation which were easy or difficult. The variety of answers given indicate that a large number of factors might be considered in the future. Those aspects cited as difficult included:

- Last-minute delivery of materials.
- Insufficient quantities of materials for large classes.
- The time and paper required to duplicate black-line masters.
- Travel distances to teacher inservice sessions.
- Amount of time teachers are out of the classroom in order to attend these sessions.
- Integration of textbook and manipulatives after the program was underway.
- Need for an aide in combination classes.
- Amount of teacher time required to prepare for lessons.
- Strategies for whole-group instruction which preclude small-group or individual instruction.
- Noise levels which are not consistent with some teaching styles.

Principals also mentioned several factors which they believe facilitated the implementation. Like those aspects cited above, they are valuable in highlighting what principals may consider to be important in implementing innovative programs. Those factors mentioned which may contribute to the relative ease of implementation include:

- Ability and willingness of the developers to model the program and answer teachers' questions.

- Content and quality of the teacher training.
- Timely delivery of materials.
- A school organization which allows teachers of the primary grades to communicate frequently and work together closely.
- Provision of training and materials.
- Integration of text and manipulatives.
- Use of instructional aides.
- Teacher enthusiasm and experience with the program.
- Interaction among PMP teachers at inservice sessions.
- Principals' positive attitude toward the program and understanding of its philosophy, goals and strategies.

Several program changes were instituted during this year, such as revisions to the teacher's manual, expansion into second grade, and emphasis on integrating the textbook and manipulatives. When asked how their staffs had dealt with these changes a large majority of principals felt that they had done so quite successfully. Three principals reported that the teachers' initial reaction to the integration of textbook and manipulative was negative, but that the teachers had since adjusted quite well to this change.

Principals were also asked if they believed that their staffs could maintain the program in first and second grades next year without additional inservice training. Half felt that their experienced PMP teachers could do this without additional training. The other half saw a need for some training, although it would not have to be as extensive as the current inservice program. With the exception of one principal, all believed that teachers who are new to the program next year will definitely need inservice training.

Program Support

Nearly all the principals interviewed felt that there is a great deal of staff support for PMP, especially from teachers in the program. Many believed that teachers become even more enthusiastic the longer they are in the program.

When asked about others within the school system who have been supportive, principals most often mentioned that the program developers had provided assistance to teachers. Some mentioned that area mathematics specialists were interested in the program, but most did not feel a need for direct assistance from the area office.

The majority of principals do not believe there is a need for any additional program support. One feels a need for an instructional aide, and

two call for more assistance in explaining the program to parents, either through parent workshops or through additional support to teachers in explaining the program. Three principals specifically requested that the inservice training be continued, especially for teachers who enter the program in the future.

The PMP has been explained to parents in a variety of ways, primarily through school newsletters, PTA meetings, and Back-to-School Nights. Principals report little parent reaction, although the majority indicate that parents have a positive attitude toward the program. A few mentioned isolated instances of positive comments or questions from parents, but even fewer mentioned parental concerns. Two principals reported that parents are actively supporting the program by making manipulatives kits for their children to use at home, or by producing extra manipulatives for classroom use.

Program Expansion

Virtually all the principals believe PMP is appropriate in first grade; all but one thought it was appropriate in second grade. More than 70% of them feel the program is also appropriate for students in third grade and more than half see it as appropriate for kindergarten. Although only four principals favor expansion into the upper grades, several others feel that a manipulatives approach, but not necessarily the entire program, would be beneficial for introducing concepts throughout all elementary grades.

With the exception of one principal, all support expansion of the program to a larger number of schools. The one principal who did not favor this expansion would prefer the adoption of Open Court materials or a text-based program supported with PMP manipulatives and inservice.

Recommendations of Principals

At the conclusion of each interview, principals were asked to make specific recommendations which they felt might be helpful if PMP were to be expanded. A large number of suggestions, many of them unique, were made regarding several factors important to program implementation.

Principals stressed the need for a systematic method of disseminating information about PMP philosophy, goals and objectives. Included in their suggestions were procedures for providing this information to parents, teachers, principals, and area mathematics specialists. They felt that the delivery of program materials had been generally satisfactory. However, several stressed that the most important consideration should be ensuring that program materials are delivered in a timely fashion. Principals favored the continuation of inservice sessions, particularly for those new to the program, and felt that experienced PMP teachers will need considerably less training. They also supported the continued integration of textbooks and manipulatives but suggest that teachers be assured flexibility in determining when to use each of these. A large majority of principals stressed that the desires of the school staff should be the most important consideration in the selection of schools for future participation in the program. They recommended

selecting only those schools in which teachers and principals want to implement PMP. A list of specific recommendations made by principals is located in Appendix A.

Teacher Questionnaire

Survey of Teacher Attitude

PMP teachers are highly positive about this program regardless of the grade they teach or the length of their experience with the program. This is true for their attitudes toward the general worth of the program and toward such aspects of program implementation as teacher training, program materials, and classroom use.

Table 1 provides means scores for teachers by grade level taught and years of experience in PMP. For both the worth of program and implementation scales, the ratings of all grade level and experience groups were considerably higher than neutral, but differences between the groups were slight.

Table 1

Attitude Scores by Grade Taught and Years Experience in the Program

	Worth of Program (12 items)		Implementation (14 items)	
Group	Mean Score	Standard Deviation	Mean Score	Standard Deviation
Grade 1 (n=37)	45.97	8.70	51.76	7.18
Grade 2 (n=25)	45.20	8.95	52.28	6.21
Year 1 (n=47)	44.40	8.07	50.49	6.22
Years 2-4 (n=22)	46.05	10.27	53.59	7.53
Total Group (n=69)	44.93	8.86	51.48	6.82
Neutral Score	36.00		42.00	
Reliability (Alpha)	.91		.75	

Worth of the Program. Twelve statements on the questionnaire were used to assess teachers' general feeling about the value of PMP as a strategy for teaching mathematics. Their positive feelings about the program were especially evident in the following items. Two-thirds or more of the teachers agreed with each of these statements:

- This program helps my students understand mathematical concepts beyond those traditionally introduced in first grade (Item 9).
- My students are more motivated to learn with the Primary Mathematics Program than they would be with a textbook program (Item 22).

- This program provides for the needs of my slower students (Item 18).
- Manipulatives should be used daily for mathematics instruction in the primary grades (Item 29).
- Any difficulties experienced when implementing the program are outweighed by the benefits (Item 12).
- I hope to continue using the Primary Mathematics Program next year (Item 26).

In addition, an even larger majority of the teachers disagreed with the following negative statements:

- Students using this program will be less well prepared to learn future mathematical concepts (Item 14).
- The Primary Mathematics Program should be used primarily in remedial situations (Item 5).

Responses to the remaining four statements on the scale may be helpful in highlighting some uncertainty and divided opinion about the comparative value of PMP as a teaching-learning strategy. The statement below (Item 8) received equal numbers of agree and disagree ratings. Although this was the only item on this scale to receive a rating indicative of a negative attitude, it was only slightly negative and seems to represent a case of divided opinion:

- The Primary Mathematics Program fails to provide for the needs of my top students (Item 8).

Three other statements appear to reflect some degree of teacher uncertainty. Although responses were positive, more than one-third of the teachers were uncertain about each of these items:

- Students in this program learn more than students in other mathematics programs for the primary grades (Item 4).
- Using the Primary Mathematics Program is the best way for my students to achieve the objectives which appear in the Teacher's Manual (Item 15).
- My students learn more with this program than with any other approach I have used to teach mathematics (Item 19).

Results of the 12 items assessing the perceived worth of the program were also analyzed separately for first and second grade teachers and for teachers with one year, and more than one year, of experience in the program. These results illustrate that, for nine of the twelve items, the teachers' opinions are relatively consistent across groups. In only three areas were considerable differences found:

- All groups feel strongly that PMP should not be limited to remedial situations, but teachers of first grade feel even more strongly about this than do second grade teachers (Item 5).

- Second grade teachers and teachers with more program experience are more inclined to believe that PMP provides for the needs of their top students than are first grade teachers and those who are new to the program (Item 8).

- All groups soundly reject the idea that their students will be less well prepared to learn future mathematical concepts, but those who have taught the program for more than one year are even more inclined than others to feel this way (Item 14).

Implementation of the Program. The second scale on the questionnaire contained 14 statements addressing three important aspects of program implementation: teacher training, program materials, and classroom use. These items, like those addressing the general worth of the program, reveal a very positive teacher attitude, particularly toward training and materials. The intensity of this attitude is especially evident in seven of the 14 items. Over three-fourths of the respondents agreed with these statements:

- The inservice sessions provided the training necessary for me to teach the Primary Mathematics Program (Item 13).

- The inservice sessions were relevant to my day-to-day experiences in the classroom (Item 24).

- I will be able to implement the program next year without additional inservice training (Item 7).

- The manipulative materials provided are appropriate for the tasks the children are asked to perform (Item 20).

- The student booklets are helpful in achieving the Primary Mathematics Program objectives (Item 27).

- The unit overview charts are helpful in preparing for teaching the unit (Item 11).

- The inservice sessions were not necessary for me to implement the program (Item 10--teachers disagreed with this item).

Responses to two additional statements regarding materials are also indicative of positive feelings, although responses were not as positive as those above:

- The assessment inventories are helpful in assessing children's progress in mathematics (Item 16).

- The Teacher's Manual is difficult to use (Item 28).

Five statements concerning the use of the program in the classroom were included in the implementation scale:

- Coordinating the textbook pages and manipulative materials has not been a difficult task (Item 23).

- Teaching mathematics now takes too much of my time (Item 21).
- Planning for mathematics lessons now takes too much of my time (Item 17).
- It is easy to evaluate my students' progress in this program (Item 6).
- Managing the program materials requires more time than it should (Item 25).

Responses to the first two of these (Items 23 and 21) were quite positive, with over 70% of the teacher reporting that coordinating textual and manipulative materials was not difficult and disagreeing with the statement that teaching mathematics was too time consuming. Item 17 was only slightly positive. The last two items (6 and 25) received a slightly negative response from teachers and reflect wide ranges of opinion regarding materials management and student evaluation.

Differences between the responses of first and second grade teachers were more apparent on this implementation scale than on that addressing program worth. First grade teachers were more likely than second grade teachers to feel that student evaluation is easy (Item 6) and that the assessment inventories are helpful (Item 16). Second grade teachers, on the other hand, were more likely to feel that the Teacher's Manual is easy to use (Item 28) and that the inservice sessions were both necessary (Item 10) and relevant (Item 24).

On several items, teachers with more than one year's program experience were more positive than those who began the program this school year. These more experienced teachers are more apt to believe that:

- The manipulative materials are appropriate (Item 20).
- The assessment inventories are helpful (Item 16).
- Student evaluation is easy (Item 6).
- The time requirements for planning lessons (Item 17) and managing materials (Item 25) are not excessive.
- Coordinating manipulatives and textbook pages is not difficult (Item 23).
- They will be able to implement the program next year without additional training (Item 7).

Teacher Response To Open-Ended Questions

Teachers were asked to respond to three open-ended survey questions and provide any other comments they wished to make about the program.

- What do you see as advantages of the PMP?

- What do you see as disadvantages?
- What aspects of this program would need to be improved if it were to be made available for use in all county elementary schools?

The advantages, disadvantages and needed improvements cited by teachers are highlighted below.

Advantages of PMP. Teachers written comments indicated strong support for PMP. Typical statements included:

"It's a well planned program. I personally think it's wonderful."

"This program is one of the strengths in Fairfax County first grades!"

"This program has given me insight into the nature of various mathematical concepts. I have not experienced these concepts to such an extent prior to using the PMP."

"I wish I had been taught math this way. If I had maybe I would not have 'math-a-phobia.'"

The advantages mentioned most frequently related to children's motivation to learn mathematics, their increased understanding of mathematics, and the appropriateness of the student materials.

A majority of teachers (36 of the 68) reported that children have a better understanding of mathematical concepts and of problem solving techniques. Many teachers (24) attribute this understanding of concepts to the concrete "hands on" activities the children experience before moving to the abstract level. "Children develop a better understanding of the mathematical concepts being taught because of their use of manipulatives. Lessons in each section are presented in a logical sequence." Many of the teachers (25) reported that children are motivated to learn mathematics. Students enjoy learning mathematics and using the variety of program materials.

Teachers (23) commented positively about the durability, soundness, and attractiveness of PMP materials. The materials are readily and immediately available for the teachers and children to use. Several teachers stated that it is useful for each child to have his/her own set of materials. Summarizing the enthusiasm for the manipulative component for the program materials, one teacher stated, "The manipulatives are superb and I wouldn't teach without them . . . ."

Several teachers also commented that textbook integration with all the other materials had proceeded smoothly. Four teachers commented that the program was well suited for the bright and creative student. Six teachers noted that although the implementation of PMP during the first year may have been time consuming, they felt that "it is worth it." Alluding to other advantages, three teachers said that the implementation of the program strengthened relationships among children and teachers. The program helped to reinforce the social skills of sharing and helping others.

Disadvantages and Needed Improvements. Teachers felt that certain aspects of the program would need to be improved if it were made available for use in all county schools. The most often mentioned areas related to management of program materials (26), provisions for more advanced learners (15), and the teacher's manual (10). Some teachers felt the program materials should be disseminated to schools well in advance in order to facilitate teacher planning and understanding of the program. Many indicated that more suggestions are needed regarding classroom management strategies for organizing, storing, and distributing materials. While many teachers felt the program was appropriate for their students, some teachers indicated that provisions for more advanced students need to be included in the program. Several teachers suggested that although the teacher's manual is well sequenced and thorough, it could be condensed, and made more "serviceable" and less cumbersome.

Several teachers made comments regarding the inservice training. Some teachers noted that inservice training is essential for those entering the program. One teacher specifically commented on "the need to understand the value and philosophy behind the manipulative approach to mathematics." Several felt that inservices could be shorter. One suggested that a peer group of pilot teachers assist teachers who are new to the program.

When asked about disadvantages of PMP the comment most often made related to an increase in the amount of teacher preparation time (25 teachers). Eight teachers indicated that they need extra assistance in organizing the materials for daily use and in teaching the lessons. They suggested that an aide would be helpful in addressing this need. Three who teach combination classes indicated a need for ideas/strategies on how to use the program in these classes, where there is a wide spread of ability levels.

Regarding seatwork, several teachers commented that more drill and rote practice exercises are needed. One teacher suggested that these practice sheets could help the teacher evaluate student progress since some of the oral assessment exercises take a long time to use. Some of the seatwork and other activities involve too much paper or preparation time for the number of skills covered.

Teacher Self-Report

The Teacher Self-Report was used to collect information concerning the use of PMP teaching materials and the evaluation strategies employed by PMP teachers. A summary of results for these two topics are presented below. Additional data tables are located in Appendix B.

Use of PMP Teaching Materials. Teachers reported on the extent to which they used selected materials, and the degree to which they modified PMP lesson plans. Table 2 displays the frequency of use of five specific types of PMP teaching materials included in each section of the teacher's manual: unit overview charts, assessment inventories, instructions for individualizing lessons, substitute plans and suggested textbook pages. More than 95% of the teachers are making some use of each of these materials with the obvious exception of substitute plans, which are intended for use only in the teacher's absence. Textbook pages recommended in the PMP teacher's manual are

most frequently used, while suggestions for individualizing the lesson are more likely to be used only with selected sections.

Table 2

Percent of Use of Teaching Materials*

Indicate how often you have used the parts of the Primary Mathematics Program Teacher's Manual listed below.

Materials	Every Section	Most Sections	Some Sections	Rarely Used	Not Used
Unit Overview Charts	35%	29%	23%	10%	3%
Assessment Inventories	23	28	33	13	3
Suggestion for Individualizing Lessons	15	29	45	9	3
Substitute Plans	7	13	41	28	12
Textbook Pages	50	22	22	1	4

*Percentages may not total 100% due to rounding error.

Differences in teachers' use of PMP materials were also analyzed according to grade level, years of experience with PMP, and the number of inservice programs attended. The only difference noted was the tendency for second grade teachers to make more extensive use of assessment inventories. This difference was not associated with years of experience teaching with PMP or with the number of inservices attended.

Suggested textbook pages have been incorporated in PMP this year. As noted earlier, this component of the program was reported to be used more often than any of the other materials investigated. No differences in textbook usage were found by experience level or number of inservice programs attended.

PMP lesson plans are used by all teachers in the program, although the majority (82%) make some modifications to most of the lessons. An additional 8% of the teachers reported that they make extensive lesson plan modifications while the remaining 10% report following the plans exactly. Further information about the types and extent of lesson plan modifications was collected through classroom observation and is reported in that section.

Evaluation Strategies. It appears that PMP teachers do not make extensive use of formal assessment methods to evaluate their students' mathematics skills as shown in Table 3. Twenty-three percent reported that they tested their students at least once a week, while 66% said they used a test once a month or less. Another 11% reported not using formal assessments methods at all.

Table 3

Reported Frequency of Student Testing

On the average how often do you use a test (e.g., teacher-made, textbook, Primary Mathematics Program inventory) to evaluate your students' math skills?

Frequency	Number	Percent
More than once a week	1	2%
Once per week	14	21
Once per month	28	42
Once per grading period	16	24
Not at all	7	11

Teachers also reported on their maintenance of individual types of mathematics assessment records. What they reported here indicates that teachers may use more informal assessment methods. As shown in Table 4, almost all PMP teachers keep samples of student worksheets, and a large percentage maintain student folders. Nearly half make anecdotal notes regarding individual students.

Table 4

Types of Assessment Records Maintained

Which of the following types of records do you maintain for individual students?

Type of Record	Number	Percent
Anecdotal Notes	30	46%
Sample Worksheets	66	97
Textbook Tests	37	54
Teacher-Made Tests	47	71
PMP Assessment Inventories	48	73
Student Folders	52	79
Other	26	49

Some differences in the maintenance of assessment records were associated with different grade levels. Far more first grade teachers kept anecdotal notes for their students, while second grade teachers were more likely to record the results of PMP assessment inventories. Teachers with more experience using PMP tended to rely on teacher-made tests more than did teachers new to the program.

Description of Most Recent Mathematics Lesson

From the description of the most recent mathematics lesson provided by teachers in both PMP and comparison schools, ORE tried to determine whether there were discernable differences in the way teachers in PMP and non-PMP classes used textbooks and manipulatives.

For this portion of the study a manipulative is defined as a concrete object that a student can hold which assists in the learning of mathematics. In order to determine whether objects used in lessons were manipulatives teachers were asked to describe the manipulatives and how they were used in the lesson. Items such as flash cards with number facts were not considered manipulatives; instead these were viewed as extensions of a paper and pencil activity, an activity at the abstract level. Paper coins which help to promote the notion or concept of the value of money were considered manipulatives.

Some differences were identified in the mathematics lesson descriptions concerning the reported student use of manipulatives. A greater proportion of PMP teachers reported that students used manipulatives, than did teachers in the comparison schools. In the comparison schools, fewer second grade than first grade teachers reported that students used manipulatives, while PMP teachers reported nearly equal use in the two grades. PMP teachers also reported that children used manipulatives without textual materials more often than teachers in the comparison schools (Table 5).

Table 5

Reported Student Use of Manipulatives

By Program and Grade

	Comparison Classes						PMP Classes					
	Grade 1 (N=27)		Grade 2 (N=27)		Total (N=54)		Grade 1 (N=39)		Grade 2 (N=29)		Total (N=68)	
Materials Used	N	%	N	%	N	%	N	%	N	%	N	%
Manipulatives alone	1	4	0	0	1	2	12	31	15	52	27	40
Manipulatives with textual materials*	21	78	15	56	36	67	20	51	10	34	30	44
Total Use of Manipulatives	22	81	15	56	37	69	32	82	25	86	57	84

*Textual material includes PMP student booklets in addition to adopted textbooks.

There were also differences in the reported student use of textual materials. Nearly all the teachers in the comparison schools reported that more students used textual materials, while just over half of PMP teachers reported this. However, more teachers in the comparison than PMP group reported that students used the textbook without the use of manipulatives, but students in both groups used the textual materials in combination with manipulatives more often than the textual materials alone.

Table 6

Reported Student Use of Textual Materials*

By Program and Grade

	Comparison Classes						PMP Classes					
	Grade 1 (N=27)		Grade 2 (N=27)		Total (N=54)		Grade 1 (N=39)		Grade 2 (N=29)		Total (N=68)	
Materials used	N	%	N	%	N	%	N	%	N	%	N	%
Textbook alone	4	15	10	37	14	26	3	8	1	3	4	6
PMP student booklet alone	N/A		N/A		N/A		4	10	0	0	4	6
Textual Materials and manipulatives	21	78	15	56	36	67	20	51	10	34	30	44
Total Use of Textbook/ PMP Student Booklet	25	93	25	93	50	93	27	69	11	38	38	56

*Textual materials includes PMP student booklets in addition to adopted textbooks.

Teachers in both groups who used textual materials reported using them mostly for review and practice. The comparison group teachers used the textbook more often than PMP teachers to introduce and develop the lesson. PMP teachers used the textbook slightly more to assess students than did the comparison teachers. PMP teachers also used PMP booklets, mostly for review and practice.

Table 7

Reported Purposes for Using Textual Materials

By Program

Textual Materials	Comparison Classes Text (N=50)		PMP Classes Text (N=20)		PMP Booklets (N=21)	
Used to:	N	%	N	%	N	%
Introduce	16	32	1	5	2	10
Review/practice	39	78	19	95	14	67
Develop	19	38	1	5	4	19
Assess	11	22	7	35	1	5

Caution must be exercised when interpreting this data. The information is based on teachers' description of a single math lesson taught in mid-March. At the time of reporting, a larger number of the comparison classrooms were teaching a lesson on measurement or money and three quarters of them were using manipulatives to do this. Teachers traditionally incorporate manipulatives when teaching measurement and money. Therefore, what is reported here may not accurately represent their use of manipulatives throughout the year. The reader must also be aware that from the written descriptions one can not accurately determine the degree to which the manipulatives were used, the amount of student exploration of mathematics concepts to foster understanding, or the extent to which manipulatives were used for rote practice.

Classroom Observations

The data obtained from 25 classroom observations provide information about lesson plan modification, opportunities for teachers to evaluate students,and ways teachers dealt with special learning situations. Results of these observations are presented below.

Lesson Plan Modifications

Observation results tend to support the data obtained from the teacher self-report; that is, approximately 85% of the observed lessons represented some modification of the PMP lesson plans, and less than 5% of these were major modifications. The remaining 15% were based entirely on the teacher's manual. The modifications fell into five distinct categories as shown in Table 8.

Table 8

Types of Lesson Plan Modifications

Frequency of Each Type

Type of Modification	Grade 1	Grade 2	Total
Review	11	13	24
Transition	4	6	10
Increased Difficulty	1	7	8
Reduced Difficulty	2	0	2
Classroom Management	1	2	3
Total Modifications	19	28	47

The majority of modifications to lesson plans were for review purposes. Teachers often added activities from previous lessons or units to introduce new materials. Transitional activities representing minor modifications were made to help students move from one activity to the next, such as, from discussion to worksheets. Some parts of lessons were modified to increase their difficulty or to present a more advanced version of a concept. Examples of this type of modification include giving advanced learners more difficult problems, deleting repetitious material, or adding more challenging worksheets or textbook pages. Another type of modification reduced the difficulty level of activities. Teachers attempting to make an activity less challenging were most likely to delete sections of a lesson, saving that section for a later date when they felt their class would be better able to understand the concept. The last type of adaptation related to classroom management. Teachers elected to substitute manipulatives or alter the instructional grouping recommended for the lesson.

An important part of the instructional strategy of PMP is the use of manipulatives, open-ended questions, and questions which draw upon a child's personal experiences. During the lesson activities, observers also noted whether or not modifications were made relative to any of these strategies. All teachers observed asked open-ended questions. Some teachers went beyond the lesson plan, encouraging children to look for a variety of patterns, think of different words or phrases, or go beyond the original scope of the discussion. There was little evidence of lesson modification related to the use of student's personal experiences or to the use manipulatives.

Opportunities to Evaluate Students

PMP lessons provided teachers with three types of opportunities to evaluate student understanding: (1) observing students as they work individually, (2) calling on an individual to answer a question or solve a problem as the group watches, and (3) reviewing the student's written work. Table 9 summarizes frequency with which each of these types of evaluation opportunities arose in the observed lesson units.

TABLE 9

Number of Lesson Parts with Evaluation Opportunities Observed

Type of Evaluation Opportunity	Grade 1 (N=19)	Grade 2 (N=28)	Total Group (N=47)
Observing Individuals	18	15	33
Questioning Individuals in a Group	19	17	36
Reviewing Written Work	5	12	17

Each of the observed PMP lesson parts afforded at least one type of opportunity for evaluation. The typical lesson part included questioning of a few students within the group or observing students as they work individually, and many included both of these. The grade differences show more opportunities for individual and group questioning at first grade more often, and review of written work at second grade.

Classroom observers used these evaluation opportunities to indicate how well students demonstrated understanding of the concepts covered in the lesson. They recorded the number of students observed and the number of these who demonstrated understanding. It was assumed that a correct response or assignment demonstrated student understanding of the concept being presented in a particular lesson unit. In most lesson parts, a large majority of students demonstrated that they understood the material.

Special Learning Situtations

Situations in which students might experience some difficulty with PMP concepts were examined more closely. Observers distinguished between two types of situations: those in which teachers provided for the needs of students who had some difficulty understanding a concept, and those in which the needs of these "special learners" were not met. In 40% of the observations, teachers were able to provide extra help to individual students. There were only two cases observed in which a student's need was not met. In both cases the youngsters were unable to do their assignment because they did not understand the directions.

During the observations, informal comments were offered spontaneously by five teachers. They commented that PMP was particularly effective for students with special learning needs. One teacher explained, for example, that a legally blind child in her class had no difficulty with mathematics concepts using the manipulative approach. Teachers also reported that students with academic problems in other subject areas were able to succeed in mathematics because they could focus on the manipulatives.

Achievement Testing

For the second consecutive year, test data was collected for the longitudinal study of mathematics achievement. The California Achievement Tests were administered to students in 34 PMP and 33 comparison classes. All of these second grade students were included in last year's study of first grade achievement. No significant differences were found between scores of the two groups. The mean raw scores and corresponding percentile rankings for the two subtests are shown in Table 10. Composite scores for the Metropolitan Readiness Tests (MRT) battery administered in May 1982, are included in the table to illustrate that the initial difference between these groups was slight. Appendix D contains additional test data.

TABLE 10

Mean Raw Scores and Percentile Rankings

	CAT Mathematics Battery						MRT Battery	
	Computation		Concepts and Applications		Total		Total	
	Mean	%ile	Mean	%ile	Mean	%ile	Mean	%ile
PMP Students (N=286)	21.9	67	32.3	66	54.1	70	77.0	72
Comparison Students (N=312)	22.1	67	32.6	71	54.7	72	76.9	72

When interpreting these results, it is important to keep the following points in mind:

- Neither group scored significantly higher on any of the CAT scores, even when students' scores were adjusted to compensate for any initial individual differences on the MRT.
- Because the CAT raw scores are near the center of the distribution, conversion to percentile rankings tends to exaggerate the actual performance differences between the two groups. At this point in the score distribution, a single raw score point difference can yield a percentile difference of as many as seven percentile points.
- Kindergarten MRT scores of the two groups are not significantly different.

Teachers' Comments About the Tests

Both PMP and non-PMP teachers were asked to identify the content and learning processes which they felt were not measured by the mathematics portion of the California Achievement Tests (CAT). Of the 34 PMP teachers

polled, 19 responded as did five of 33 comparison teachers. It appears that PMP teachers have greater concern regarding the content of the test and the discrepancy between testing and teaching styles than do non-PMP teachers. This is suggested by the fact that a larger number of PMP teachers responded to the survey and a much higher percentage of those expressed concern in these areas. A summary of their comments appears below.

Comments of PMP Teachers. The comments of several teachers indicated that the CAT, administered in early March, tested some content which had not yet been taught. Some other teachers specifically identified these content areas: regrouping, number line, and addition and subtraction of two- and three-digit numbers. Three suggested that the test be administered later in the year so that more units would be covered. On the other hand, one teacher commented that geometry had been included in the curriculum but not on the test.

Regarding learning processes, several teachers alluded to a discrepancy between the way their students are learning mathematics and the manner in which the test presents the material. One teacher said, "Many seemed 'lost' without counters and diagrams to help them." Two teachers also commented that the standardized testing situation did not provide an opportunity for students to work with a partner, a practice that is part of the PMP.

Non-PMP Teachers. Comments of the five teachers responding ranged from "second grade subject content was adequately tested" (two teachers) to the fact that multiplication and regrouping in subtraction were tested but had not been taught. One teacher called for more questions relating to skip counting, ordering numbers, geometry and telling time. None of the non-PMP teachers responded to the question related to learning processes.

Informal Data Collection

Members of the evaluation team talked with and listened to teachers and administrators at various inservices and meetings. These interactions provided the evaluation team with opportunities to learn about relevant issues related to PMP and to directly observe group and individual reactions to these issues. Many of the issues and concerns emerging at these sessions are reflected in the results of other data gathering activities.

Teachers were very enthusiastic about PMP. When the integration of the textbook was introduced in November, some teachers saw it as a threat to the integrity of the program. They were very concerned that the program might be changed dramatically or discontinued. At one inservice session, a teacher spoke for others at her school and desired to go on record as not wanting to lose the program. There was also some concern about the flexibility teachers would be allowed in utilizing the textbook. Once this issue was clarified the concern regarding of textbook integration appeared to subside.

Teachers felt that the inservice programs provided them with the opportunity to interact with others who were using the program in addition to being organized, relevant, and useful. These interactions at the inservice programs were particularly helpful to teachers. Teachers also felt a close involvement with the development of PMP, since part of each inservice session

focused on program revisions suggested by teachers after they had the opportunity to use the lesson plans in their classrooms. They believed that the program developers had been very responsive to their suggestions for improving the program. Teachers expressed some concerns about evaluating students, getting materials early enough for planning, and meeting the needs of more advanced learners.

Teachers of combination classrooms talked about the need for assistance in implementing PMP. Some teachers were assisted by an aide or volunteers; others implemented the program without additional classroom assistance. There was also some concern about not having an understanding of the total program. In this same context, they felt a need for some assistance in explaining PMP to parents.

Teachers were extremely concerned that a standardized test was to be used as a measure of their students' mathematics achievement. They were fearful that their youngsters would perform in a manner which would not reflect their true understanding of mathematics, and they felt that the testing method would be inconsistent with PMP instructional methods.

At a meeting with principals, mixed reactions about the textbook mandate were apparent. Some felt that a text designed specifically for the program and POS should be developed. Some principals expressed disappointment when they learned that the program would not be expanded to the third grade in the immediate future.

SUMMARY AND DISCUSSION

In general, teachers piloting PMP are very supportive of the program as a strategy for teaching mathematics. They have a positive attitude toward the materials, activities, and teacher training. Principals concur that PMP provides an educationally sound approach to teaching youngsters and appear even more enthusiastic about the program this year than last.

It appears that PMP teachers are following the prescribed strategies using textbooks, manipulatives, and other program materials. PMP teachers use manipulatives more frequently and textbooks less frequently than their counterparts in the non-program schools. While both groups use textual materials for reinforcement of learning, PMP teachers rely on textbooks considerably less often for introduction and development of lessons and concepts. This implies that children in PMP classes are being exposed to a more concrete, manipulative approach to learning mathematics than children in non-PMP classes. This approach is consistent with current theories of early childhood development and learning.

The generally positive reception of this program can be attributed, in part, to the success of teacher training provided by its developers. This training is not only viewed as thorough, relevant, and of high quality; but it has provided direct support to teachers, an important aspect in implementing a new program.

Teachers and principals alike believe that children develop a greater understanding of mathematics concepts and that they are more motivated to learn when they are exposed to PMP. They consider these to be important advantages of the program and attribute them to the "hands-on" activities the children experience before moving to the abstract level. Students in the PMP, however, demonstrate the same achievement levels on the California Achievement Tests as their counterparts in the comparison classrooms.

This is not to say that actual differences in their proficiency do not exist. PMP students appear to be taught in a more concrete fashion and may well be at a disadvantage when taking a pencil and paper standardized test. The discrepancy between teaching and testing styles may accentuate student difficulties in this type of testing situation. What students learn from experimenting with manipulatives, verbalizing their mathematics experiences, and offering multiple responses to open-ended questions may be neither captured nor reflected by scores on a timed, multiple-choice test which limits them to pencil and paper responses. It is possible that these students might perform even better on a test which is able to assess their actual levels of mathematics concept development. Unfortunately, no tests are currently available which are considered to be adequate indicators of mathematical concept development in young learners. On the other hand, it is possible that the results of norm-referenced testing may reveal group differences at some time in the future. As stated in the initial report of this evaluation (May 1983) the effects of this program may not be reflected in achievement test scores until about grade four. This remains a possibility.

Some factors have been identified which might be detrimental to program implementation. These include student evaluation, difficulty level, and time requirements. Teachers express some mild dissatisfaction with PMP procedures for student evaluation. It is important to note, however, that teachers with more experience using PMP are more likely to find the assessment inventories useful and PMP student evaluation easy.

Those with more PMP teaching experience are also more likely to be satisfied with the difficulty level of the program. While the majority of PMP teachers believe the program is well suited for their slower learners, the possibility exists that the program is not adequately meeting the needs of advanced learners. Information from attitude items, open-ended questions, and informal teacher comments indicate that teacher opinion is divided on this issue. Some teachers would like to see provisions made for advanced learners, while others feel strongly that the program is particularly suited to "bright, creative" children.

As PMP is still in the initial phases of implementation, most teachers are following lesson plans very closely. It is possible that, as they become more experienced and comfortable with the program, they will use the materials more flexibly, adapting them to the needs of their students. This is evidenced by the fact that teachers with more PMP experience are more likely to find the student evaluation procedures to be effective and the program to be meeting the needs of their more advanced students.

Few teachers indicate that PMP increased the amount of actual teaching time but many agree that too much time is required to plan lessons and manage materials. While this teacher dissatisfaction may indicate a need for

additional management strategies, this too appears to be influenced by experience with the program. Again, those with more years of PMP experience were less likely to regard the time requirements as excessive.

Other factors appear to facilitate implementation of the program. Principals highlighted the importance of the assistance provided by the program developers, the quality of the teacher training, and the integration of the textbook and manipulatives. They feel PMP is strongly and adequately supported by teachers and the Department of Instructional Services and are pleased with the direct assistance they have received from the program developers. Principals see a need for the continuation of the inservice training in the future, although they believe that experienced PMP teachers will need less extensive training than those who are new to the program.

Most principals feel the program would be appropriate through grade three, and several believe that a manipulative approach would be beneficial in the upper grades as well. Expansion of the PMP into a larger number of schools is supported by all but one principal. When considering possible future expansion into other schools, principals offered some valuable suggestions which highlight the importance of voluntary participation, communication of program goals and philosophy, the continued flexible integration of textual materials and manipulatives, and the timely delivery of program materials.

CONCLUSIONS AND RECOMMENDATIONS

As stated earlier in this report, the purposes of this evaluation were to provide additional data for the longitudinal study of program effectiveness and to provide information for future program development, implementation, and improvement. The primary questions addressed included:

- What are principals' and teachers' attitudes toward the program?
- Are expected teacher and student behaviors observable in PMP classrooms?
- Are there differences in the way PMP teachers and teachers not in the program use manipulatives and textbooks?
- How does mathematics achievement of students in the PMP compare with that of students who are not in the program?
- What recommendations can be made regarding future program development, dissemination and delivery?

Teachers and principals are quite satisfied with the program and support the strategies it utilizes. They share positive attitudes about the student learning processes and are pleased with the program materials, the teacher training component, and the manner in which the program was implemented this year. Although there is some evidence that the program may impact considerably on teacher preparation time and may not address entirely the specific needs of advanced students, it should be noted that these concerns were less problematic for teachers who are more experienced with the program.

PMP teachers appear to be implementing the program as specified. The behaviors of students and teachers that one would expect to occur in these classrooms, do indeed occur, and these behaviors are somewhat different than what one would find in other classrooms. Although program and non-program teachers, alike, use both textbooks and manipulatives to reinforce student learning, those using PMP strategies rely more on manipulatives and less on textual materials to introduce and develop concepts.

Principals as well as teachers believe that this program motivates children to learn mathematics and that the concrete-to-abstract approach is responsible for greater student understanding of important concepts. At present, achievement test scores neither confirm not refute this belief, but achievement differences may become apparent in later grades.

In the initial report of this evaluation (May 1983) several suggestions were made regarding program development, implementation, and evaluation. Most of these were translated into action and carried out successfully within the past year. Support for the program at the school level seems as strong or stronger than it did at this time last year. The program developers continue to demonstrate responsiveness to teachers and principals by inviting and responding to new suggestions, reviewing past work, and planning together for the future of the program.

Principals and teachers have cooperated willingly and graciously with the evaluation team and have provided valuable information resulting in the following list of recommendations. It is hoped that these recommendations prove useful in future program development and improvement.

1. Consider expanding the existing first and second grade program to additional schools on a voluntary basis.

2. Consider expansion of the program to grade three if ample time for preliminary development can be provided before piloting in a small number of schools.

3. Continue to integrate textual materials with manipulatives in a way which allows teachers flexibility in adapting the program to the needs of their students.

4. Continue inservice training for teachers new to the program. Provide less intensive training for experienced PMP teachers.

5. Involve experienced PMP teachers in the training of those new to the program.

6. Streamline the teachers' guide to make it less cumbersome and easier for teachers to use.

7. Refine student evaluation strategies to make them less time consuming and easier to administer.

8. Provide teachers with specific strategies for classroom management and for teaching combination classes and advanced learners.

9. Utilize suggestions provided by teachers at this year's inservice programs as revisions are made to the second grade program; continue to solicit and respond to teachers' suggestions for program improvement.

10. Develop and implement a plan for communicating program philosophy, goals, and objectives to parents, teachers, and administrators.

11. Continue the longitudinal study of mathematics achievement begun in 1982-83.

APPENDICES

REPORT OF THE 1983-84 EVALUATION OF THE PRIMARY MATHEMATICS PROGRAM

Mary Ann Nocerino, Team Leader
MaryEllen Farmer
Susan Geiger, Ph.D.
Susan Wilkens

FAIRFAX COUNTY PUBLIC SCHOOLS
Department of Instructional Services
Office of Research and Evaluation

August 1984

APPENDICES

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APPENDIX A
PRINCIPAL INTERVIEW QUESTIONS
PRINCIPALS' RECOMMENDATIONS FROM INTERVIEWS

PRIMARY MATHEMATICS PROGRAM
Principal Interview

1. Tell me how the Primary Mathematics Program is used in your school.

2. Do you feel that the Primary Mathematics Program is a good way to teach mathematics in the primary grades?
Why/why not?

3. Do you feel that students in the program are learning as much as they would have using a different approach?
(PROBE: If "yes," ask "more?")
Is this what you expected?

4. Have your feelings about the PMP changed since last year?
(PROBE: If "yes," ask, "In what ways.")
Why? Why not?

5. Do you feel that PMP materials for students are appropriate?
How or how not?

6. Do you feel that PMP materials for teachers are adequate?
(PROBES: In terms of quantity and thoroughness. If "no," ask "how not?")

7. Can you cite any particular aspects of this implementation which were easy or difficult?

8. Were there differences between implementing it in first and second grade?

9. Do you feel your staff has been supportive of the program?
What about others, within the school system?
(PROBE: If "yes," ask "What kinds of assistance have you received from them?")

10. What kinds of additional support are needed?

11. Are you aware of any parent reaction to this program?
If yes, describe.

12. There have been several changes in the program during this year--such as revisions of the teacher's guides, expansion into second grade, and emphasis on integrating the textbook and manipulatives. How has your staff dealt with these changes?

13. Do you feel that your staff could <u>maintain</u> the program in first and second grades next year without additional in-service training?
What about teachers new to the program, would the teacher's guide and student/teacher materials be sufficient?

14. In which grades would this program be most appropriate?
Why/why not?

15. Do you feel the program should be expanded to include other elementary grades?
    If so, which grades?
    If not, why not?

16. Do you feel the program should be expanded to more schools?
    If "yes," ask "How should schools be selected?"
    If "no," ask "Why?"

17. If the program were to be expanded, what suggestions would you make regarding:

    - the dissemination of the philosophy, goals, and objectives of program
    - the delivery of program materials
    - the delivery of teacher training
      (PROBE: format, amount, location, method, personnel)
    - the integration of texts and manipulatives
    - the selection of the schools for participation in the program

PRINCIPALS' RECOMMENDATIONS FROM INTERVIEWS

(Many of these were unique. When more than a few principals made a similar recommendation, this is indicated in parentheses.)

Dissemination of Program Philosophy, Goals, and Objectives

- Develop a publication (e.g. brochure, flyer, newsletter) for parents that highlights what PMP is and what it does.
- Disseminate information to teachers through continued inservice training.
- Make more principals aware of the program through principals' meetings, etc. This should not be a "one-shot deal."
- Ensure that area mathematics specialists are well informed about the program.
- Use the dissemination model developed for the Elementary Writing Program.
- Have a "slide show-and-tell" in January to explain the philosophy and how it works. Provide feedback from teachers at that time—the problems as well as the positive features.
- Use experienced PMP teachers to help plan expansion activities and implement the program in new settings.
- Hold a meeting for parents to introduce the program at each school. All PMP teachers, principal, area mathematics specialist, and program developers should attend.
- Teachers should spread the word, not principals.
- Invite a "consultant" guest speaker to come.
- Involve local colleges; they could offer courses in PMP.

Delivery of Program Materials

- Make sure materials are delivered in a timely fashion. (Several principals stressed this.)
- Continue to distribute materials by "pony" and at inservices.
- Consider something similar to the ESS system. The county could package some boxes of non-consumable materials, deliver them as needed, and at the same time monitor what materials go into the schools.
- Inventory all math materials throughout the county, then distribute the needed manipulatives. There is a lot of unused material for math; we don't need all the materials we have now.

Teacher Training

- Continue the inservice training.
- Provide substitutes whenever possible to allow teachers to attend inservice sessions during the regular school day.
- Experienced PMP teachers may not need as much training in the future. Provide some training at the beginning of the year, with follow-up at the end of the first semester.
- Make the meeting schedule more clear, so that all are sure when they are supposed to attend.
- Try to meet in more convenient location.
- Don't use the pyramid structure.
- Have more good trainers, like the program developers.
- Provide inservice for principals.
- Avoid holding training on work days and inservice days.
- Provide on-site assistance from DIS.
- Prepare videotapes and/or train lead teachers to provide inservice to schools in pyramid.
- Avoid turnaround training, but use experienced teachers to assist in training.
- Provide training to all primary teachers.
- Avoid using substitutes whenever possible.

Integration of Texts and Manipulatives

- Continue to use the text and manipulatives as is currently done. (Several principals suggested this.)
- Allow teachers the license to determine when to use text and manipulatives.
- Negotiate with textbook publishers for a text tailored to PMP. It would not have to be a new book, just one that contains only what suits our needs. This would be a smaller book and, therefore, less expensive.
- Convince upper (administrative) levels that texts are not needed.
- Ask experienced PMP teachers to talk about how texts are used.

Selection of Schools

- Select only those schools in which the teachers and the principal want the program. The primary consideration must be the desires of the staff. (A large majority of principals stressed this.)
- Expand to smaller schools because it will cost less for materials.
- Select schools with special needs populations.
- Expand to all elementary schools.
- Select schools that don't pilot other programs.

APPENDIX B
TEACHER QUESTIONNAIRE

SURVEY MATERIALS FOR PILOT SCHOOLS
SURVEY MATERIALS FOR COMPARISON SCHOOLS
ATTITUDE SURVEY STATISTICS
SELF-REPORT STATISTICS
LESSON DESCRIPTION STATISTICS

FAIRFAX COUNTY PUBLIC SCHOOLS Fairfax, Virginia 22030

MEMORANDUM

March 12, 1984

TO: Principals Participating in the
Pilot Primary Mathematics Program

FROM: Todd Endo, Director
Office of Research and Evaluation

SUBJECT: Primary Mathematics Program Study

Part of the study of the Primary Mathematics Program involves collecting information from teachers regarding their use of the program components and their attitudes toward the program. Your assistance in administering the enclosed teacher questionnaire is requested.

All teachers participating in the Primary Mathematics Program should complete one of the enclosed questionnaires and return it to you. Please forward all completed answer sheets and questionnaires by March 23, 1984 to:

Mary Ann Nocerino
Office of Research and Evaluation
Walnut Hill Center

Thank you for your cooperation and assistance.

MAN/br
Enclosures

FAIRFAX COUNTY
PUBLIC SCHOOLS

Department of Instructional Services
Office of Research and Evaluation
Walnut Hill Center
7423 Camp Alger Avenue
Falls Church, Virginia 22042

March 12, 1984

Dear Colleague:

The Office of Research and Evaluation is conducting a survey as part of its evaluation of the Primary Mathematics Program. The information from the survey will be used in developing future plans related to the primary mathematics curriculum.

As you are a teacher involved in piloting the program, your opinions and recommendations regarding the procedures and the materials are valuable. We appreciate your taking approximately 20 to 25 minutes to complete the attached questionnaire. You are not asked to identify yourself or your school; however, you are asked to provide some identifying information to aid in the interpretation of your responses.

Please complete the attached questionnaire, and return it and the completed answer sheet to your principal. All questionnaires will then be forwarded to the Office of Research and Evaluation for analysis.

Thank you for your participation and cooperation.

Sincerely,

Todd Endo

Todd Endo
Director

MAN/br
Attachment

FAIRFAX COUNTY PUBLIC SCHOOLS
Department of Instructional Services
Office of Research and Evaluation

PRIMARY MATHEMATICS PROGRAM QUESTIONNAIRE

DIRECTIONS: Select one response for each item. Use a No. 2 pencil to mark your responses on the separate answer sheet. Do not write your name or school on the answer sheet; items 1-3 will provide the necessary identifying information.

1. What is your current assignment?

   A. grade 1
   B. grades 1 and 2
   C. grade 2
   D. grades 2 and 3
   E. other

2. How many years have you taught the Primary Mathematics Program?

   A. This is my first year.
   B. This is my second year.
   C. This is my third year.
   D. This is my fourth year.

3. Approximately how many Primary Mathematics Program inservices have you attended this school year (1983-1984)?

   A. none
   B. one-two
   C. three-four
   D. more than four
   E. uncertain

For items 4-29, use the scale below to indicate how strongly you agree or disagree with each statement.

A. Strongly Disagree
B. Disagree
C. Uncertain
D. Agree
E. Strongly Agree

4. Students in this program learn more than students in other mathematics programs for the primary grades.

5. The Primary Mathematics Program should be used primarily in remedial situations.

6. It is easy to evaluate my students' progress in this program.

7. I will be able to implement the program next year without additional inservice training.

8. The Primary Mathematics Program fails to provide for the needs of my top students.

9. This program helps my students understand mathematical concepts beyond those traditionally introduced in first grade.

10. The inservice sessions were not necessary for me to implement the program.

11. The unit overview charts are helpful in preparing for teaching the unit.

12. Any difficulties experienced when implementing the program are outweighed by the benefits.

13. The inservice sessions provided the training necessary for me to teach the Primary Mathematics Program.

14. Students using this program will be less well prepared to learn future mathematical concepts.

15. Using the Primary Mathematics Program is the best way for my students to achieve the objectives which appear in the Teacher's Manual.

16. The assessment inventories are helpful in assessing children's progress in mathematics.

17. Planning for mathematics lessons now takes too much of my time.

18. This program provides for the needs of my slower students.

19. My students learn more with this program than with any other approach I have used to teach mathematics.

20. The manipulative materials provided are appropriate for the tasks the children are asked to perform.

21. Teaching mathematics now takes too much of my time.

22. My students are more motivated to learn with the Primary Mathematics Program than they would be with a textbook program.

23. Coordinating the textbook pages and manipulative materials has not been a difficult task.

24. The inservice sessions were relevant to my day-to-day experiences in the classroom.

25. Managing the program materials requires more time than it should.

26. I hope to continue using the Primary Mathematics Program next year.

27. The student booklets are helpful in achieving the Primary Mathematics Program objectives.

28. The Teacher's Manual is difficult to use.

29. Manipulatives should be used daily for mathematics instruction in the primary grades.

Use the following scale to indicate how often you have used the parts of the Primary Mathematics Program Teacher's Manual listed in items 30-34.

A. For every section
B. For most of the sections
C. For some of the sections
D. Rarely
E. Have not used

30. Unit overview charts

31. Assessment inventories

32. Instructions for individualizing the lesson

33. Substitute plans

34. Suggested textbook pages

35. Do you modify the lesson plans in the Primary Mathematics Program Teacher's Manual?

    A. No, I follow them almost exactly
    B. Yes, I modify them somewhat
    C. Yes, I modify them extensively
    D. I do not use the lesson plans

36. On the average, how often do you use a test (e.g., teacher made, textbook, Primary Mathematics Program assessment inventory) to evaluate your students' math skills?

    A. Not at all—I use less formal assessment methods (e.g., observation)
    B. About once every grading period
    C. About once a month
    D. About once a week
    E. More than once a week

Which of the following, if any, types of records do you maintain for individual students?

Mark A if you do maintain this type of record.
Mark B if you do <u>not</u> maintain this type of record.

37. anecdotal notes

38. sample worksheets

39. textbook tests

40. teacher-made tests

41. results of Primary Mathematics Program assessment inventories

42. student folders

43. other

Answers to the questions on the next two pages should be written in the spaces provided on each page.

Mathematices Lesson Description

Provide the information below for your class's most recent mathematics lesson. (If you taught more than one group that day, choose one group only.) Include information about any seatwork which students completed outside of the mathematics period.

Date of Math Lesson _____ Grade Level ___

Purpose and Topic of Lesson _____

Circle materials used: textbook/workbook, ditto, manipulatives (describe below), other (describe below), none

If you used a textbook or workbook indicate title or publisher _____

_____. Check below to indicate how you used the textbook/workbook for this lesson.

_____ to introduce _____ to develop
_____ to review/practice _____ to assess
_____ other (please describe below)

Teachers and students often use manipulatives in a variety of ways. If you used manipulatives in this lesson, describe how you and your students used them. Use the back of this page if you need additional space.

Students	Teachers

Circle the grade level(s) you are currently teaching. 1 2 3

What aspects of the Primary Mathematics Program would need to be improved if it were made available for use in all county elementary schools? (i.e., inservices, student and teacher materials)

What do you see as advantages of the Primary Mathematics Program?

What do you see as disadvantages?

List below any additional comments you wish to make about the program.

THANK YOU FOR YOUR COOPERATION!

FAIRFAX COUNTY PUBLIC SCHOOLS Fairfax, Virginia 22030

MEMORANDUM

March 12, 1984

TO: Selected Elementary School Principals

FROM: Todd Endo, Director TE
Office of Research and Evaluation

SUBJECT: Primary Mathematics Curriculum Study

Part of the study of the primary mathematics curriculum involves collecting information from teachers regarding teaching materials and procedures. Your assistance in administering the enclosed teacher survey is requested.

All first and second grade classroom teachers should complete one of the surveys and return it to you. Please forward all completed surveys by March 23, 1984 to:

Mary Ann Nocerino
Office of Research and Evaluation
Walnut Hill Center

Thank you for your cooperation and assistance.

MAN/br
Enclosures

FAIRFAX COUNTY
PUBLIC SCHOOLS

Department of Instructional Services
Office of Research and Evaluation
Walnut Hill Center
7423 Camp Alger Avenue
Falls Church, Virginia 22042

March 12, 1984

Dear Colleague:

The Office of Research and Evaluation is conducting a survey as part of the study of the primary mathematics curriculum. The information from the survey will be used in developing future plans related to the primary mathematics curriculum.

Since you teach a primary grade, your assistance in the collection of information regarding teaching materials and procedures is valuable. Your response, however, will be anonymous. You are not asked to identify yourself or your school.

Please complete the attached survey and return it to your principal. All surveys will then be forwarded to the Office of Research and Evaluation for analysis.

Thank you for your participation and cooperation.

Sincerely,

Todd Endo

Todd Endo
Director

MAN/br
Attachment

Teacher Survey
Mathematices Lesson Description

Provide the information below for your class's most recent mathematics lesson. (If you taught more than one group that day, choose one group only.) Include information about any seatwork which students completed outside of the mathematics period.

Date of Math Lesson _____ Grade Level ___

Purpose and Topic of Lesson _____

Circle materials used: textbook/workbook, ditto, manipulatives (describe below), other (describe below), none

If you used a textbook or workbook indicate title or publisher _____

_____. Check below to indicate how you used the textbook/workbook for this lesson.

_____ to introduce _____ to develop
_____ to review/practice _____ to assess
_____ other (please describe below)

Teachers and students often use manipulatives in a variety of ways. If you used manipulatives in this lesson, describe how you and your students used them. Use the back of this page if you need additional space.

Students	Teachers

PRIMARY MATHEMATICS PROGRAM TEACHER QUESTIONNAIRE
SCALE AND ITEM STATISTICS
(N=69)

Program Implementation
(Materials, Use, Training)

Number of Items	14
Mean Item Response	3.68
Mean Scale Response	51.48
Neutral Scale Response	42.000
Standard Deviation	6.82
Reliability	.75

Item Number	Item - Scale Correlation	Mean Attitude	Standard Deviation
6	.52	2.87	1.06
7	.26	3.83	.83
10	.05	4.12	1.00
11	.17	4.06	.93
13	.47	3.99	.94
16	.45	3.44	1.00
17	.77	3.09	1.25
20	.52	4.33	.63
21	.61	3.68	1.17
23	.56	3.71	1.07
24	.49	4.03	.66
25	.69	2.73	1.25
27	.41	4.26	.74
28	.66	3.36	1.32

PRIMARY MATHEMATICS PROGRAM TEACHER QUESTIONNAIRE
SCALE AND ITEM STATISTICS
(N=69)

Worth of Program

Number of Items	12
Mean Item Response	3.74
Mean Scale Response	44.93
Neutral Scale Response	36.00
Standard Deviation	8.86
Reliability	.91

Item Number	Item - Scale Correlation	Mean Attitude	Standard Deviation
4	.82	3.42	1.01
5	.66	3.94	1.14
8	.58	2.91	1.29
9	.72	4.01	.97
12	.76	3.62	1.11
14	.68	4.10	1.00
15	.77	3.49	.90
18	.52	4.07	.89
19	.78	3.39	1.13
22	.72	4.04	.89
26	.83	4.09	.99
29	.69	3.83	1.19

PRIMARY MATHEMATICS PROGRAM TEACHER QUESTIONNAIRE
ITEM MEANS BY GRADE TAUGHT AND YEARS EXPERIENCE IN PROGRAM

Item Number	Grade 1 n=27	Grade 2 n=25	Year 1 n=47	Years 2-4 n=22
Worth of Program				
4	3.54	3.36	3.40	3.46
5	4.11	3.76	3.87	4.09
8	2.87	3.36	2.81	3.14
9	3.97	4.20	4.00	4.05
12	3.70	3.56	3.60	3.68
14	4.30	4.08	3.98	4.36
15	3.57	3.40	3.43	3.64
18	4.05	4.20	4.00	4.23
19	3.43	3.48	3.32	3.55
22	4.19	4.00	3.98	4.18
26	4.14	4.16	4.15	3.96
29	4.11	3.64	3.87	3.73
Implementation				
6	3.05	2.72	2.75	3.14
7	3.89	3.80	3.72	4.05
10	3.92	4.44	4.17	4.00
11	4.05	4.04	4.06	4.05
13	4.03	4.04	3.92	4.14
16	3.60	3.24	3.30	3.73
17	3.08	3.32	2.98	3.32
20	4.46	4.24	4.23	4.55
21	3.70	3.68	3.68	3.68
23	3.84	3.64	3.53	4.09
24	3.92	4.28	4.04	4.00
25	2.81	2.80	2.62	2.96
27	4.24	4.36	4.21	4.36
28	3.16	3.68	3.28	3.55

PRIMARY MATHEMATICS PROGRAM TEACHER QUESTIONNAIRE
RESPONSE FREQUENCIES FOR ALL RESPONDENTS
(n=69)

Item (Number)	% Agree or Strongly Agree	% Uncertain	% Disagree or Strongly Disagree
Worth of Program			
Students in this program learn more than students in other mathematics programs for the primary grades. (4)	45	41	14
The Primary Mathematics Program should be used primarily in remedial situations. (5)	16	12	73
The Primary Mathematics Program fails to provide for the needs of my top students. (8)	45	10	45
This program helps my students understand mathematical concepts beyond those traditionally introduced in first grade. (9)	77	16	7
Any difficulties experienced when implementing the program are outweighed by the benefits. (12)	67	13	20
Students using this program will be less well prepared to learn future mathematical concepts. (14)	7	15	78
Using the Primary Mathematics Program is the best way for my students to achieve the objectives which appear in the Teacher's Manual. (15)	48	44	9
This program provides for the needs of my slower students. (18)	83	10	7
My students learn more with this program than with any other approach I have used to teach mathematics. (19)	45	35	20
My students are more motivated to learn with the Primary Mathematics Program than they would be with a textbook program. (22)	77	16	7

Item (Number)	% Agree or Strongly Agree	% Uncertain	% Disagree or Strongly Disagree
Worth of Program (continued)			
I hope to continue using the Primary Mathematics Program next year. (26)	78	15	7
Manipulatives should be used daily for mathematics instruction in the primary grades. (29)	65	16	19
Implementation			
It is easy to evaluate my students' progress in this program. (6)	32	29	39
I will be able to implement the program next year without additional inservice training. (7)	77	15	9
The inservice sessions were not necessary for me to implement the program. (10)	7	10	83
The unit overview charts are helpful in preparing for teaching the unit. (11)	86	6	9
The inservice sessions provided the training necessary for me to teach the Primary Mathematics Program. (13)	87	1	12
The assessment inventories are helpful in assessing children's progress in mathematics. (16)	61	16	23
Planning for mathematics lessons now takes too much of my time. (17)	39	13	48
The manipulative materials provided are appropriate for the tasks the children are asked to perform. (20)	91	9	0
Teaching mathematics now takes too much of my time. (21)	22	7	71
Coordinating the textbook pages and manipulative materials has not been a difficult task. (23)	71	6	23

Item (Number)	% Agree or Strongly Agree	% Uncertain	% Disagree or Strongly Disagree
Implementation (continued)			
The inservice sessions were relevant to my day-to-day experiences in the classroom. (24)	83	16	1
Managing the program materials requires more time than it should. (25)	49	15	36
The student booklets are helpful in achieving the Primary Mathematics Program objectives. (27)	93	4	3
The Teacher's Manual is difficult to use. (28)	30	9	61

PRIMARY MATHEMATICS PROGRAM TEACHER QUESTIONNAIRE
SELF-REPORT ITEM STATISTICS

Number of Teachers Who Maintain Mathematics
Assessment Records for Individual Students

Record Type	Grade 1 (N=37)	Grade 2 (N=25)	1 Year (N=47)	2-4 Years (N=22)
Anecdotal Record	23	6	17	13
Sample Worksheets	35	25	45	20
Textbook Tests	21	14	27	10
Teacher-made Tests	26	16	29	18
Results of PMP Assessment Inventories	22	23	31	17
Student Folders	31	17	33	19

PRIMARY MATHEMATICS TEACHER QUESTIONNAIRE
LESSON DESCRIPTION

Response Frequencies for Respondents
in PMP and Comparison Schools

	Comparison Schools		PMP Schools	
	Grade 1 (N=27)	Grade 2 (N=27)	Grade 1 (N=39)	Grade 2 (N=39)
Purpose/Topic of Lesson				
Counting	2	0	2	1
Subtraction/Addition	8	1	12	12
Multiplication/Division/ Fraction	2	2	7	3
Place Value	5	9	11	8
Money	5	5	2	2
Measurement	4	10	1	0
Comparing Numbers	0	0	2	3
Geometry	1	0	2	0
Use of Textbooks and Manipulatives				
Textbook only	4	10	3	1
Textbook and Manipulatives	21	15	7	9
Manipulatives only	1	0	12	15
Other	1	2	0	3
PMP student booklets only	NA	NA	4	0
PMP student booklets and manipulatives	NA	NA	12	1
Textbook/workbook and PMP student booklets	NA	NA	1	0
Reason for Using textbook/ workbook:				
introduce	8	8	0	1
reinforce	19	20	9	10
develop	11	8	1	0
assess	8	3	4	3
Reason for Using PMP student booklets:				
introduce	NA	NA	2	0
reinforce	NA	NA	13	1
develop	NA	NA	4	0
assess	NA	NA	1	0

APPENDIX C
CLASSROOM OBSERVATION INSTRUMENT

Guide for Completing the PMP Observation Instrument

Activities Deleted

List activities outlined in lesson guide but not observed.

Activities Added

Briefly describe observed activities which go beyond those in lesson guide or represent significant modifications of lesson guide activities.

Personal Experience

Mark box to indicate how children's personal experiences were drawn upon. Use the following scale:

+ = beyond what was called for in lesson guide
✓ = as called for in lesson guide
- = less than what was called for in lesson guide
+/- = something not used and something substituted in its place

If + or - is used describe modifications in space provided.

Open Ended Questions

Mark box to indicate how students give or are encouraged to give varied or multiple responses to the same question. Use the scale outlined above.

Manipulatives

Mark the box to indicate how manipulatives were used. Use the scale outlined above. Describe modifications, noting the type of manipulative and how it is used (e.g., copying teacher, self-exploration, writing, etc.)

Understanding

Describe your general impression of how well the total class understood the concept/skill in this part of the lesson; i.e., do students seem to be understanding what is being taught as demonstrated by their behavior (answering questions, using manipulatives), not as interpreted through facial expressions or degree of attention.

Evaluation Methods/Opportunities

Describe opportunities the teacher has to evaluate how well the children are understanding the concept/skill being taught, by circling the appropriate letters to indicate that the:

L While class is working on their own, teacher is looking at individual students as they work
Q During whole group instruction, teacher calls on individual students to answer questions, participate in a discussion or demonstrate a solution
W Students hand in written work
O Teacher has other opportunities to evaluate (describe in space provided).

Special Learning Situations

Methods 1. In this space, describe any ways in which the teacher or students provide for special learning situations; i.e., students who seem to be having difficulty, students who are moving ahead of the class, children who have been absent, children who do not understand English, etc. Also note how activities from "Individualizing the Lesson" in the teachers guide are used.

Needs 2. In the second space describe any observed student needs in special learning situations which aren't being met

Management

- Grouping: circle the appropriate letter(s) to indicate how the class is grouped for this part of the lesson:

  W = whole class instruction
  L = large group instruction (>6 in a group)
  S = small group instruction (3-6 in a group)
  P = pairs
  I = individual

- Material Handling: briefly describe how manipulatives were distributed, collected and stored.

- Behavior Management: briefly describe how student attention was maintained or any other significant observations regarding management of student's behavior.

- Other: briefly describe any other significant observations related to classroom management.

General Impressions

Note your personal impressions/opinions related to what you observed in this part of the lesson.

Note: If the teacher is not using a lesson from the guide, observor will describe everything as noted on sheet but ignore all rating boxes.

Other

Use back of sheet to

- diagram seating plan

- record outline of the lesson if it deviates or significantly from lesson plan from the guide or if the teacher does not use a lesson plan from the guide.

Section:
Lesson:
Part:
Page(s):

PMP OBSERVATION INSTRUMENT

Observer:
Date:
School:
Grade:
Total Lesson Time:

Lesson Plan Modifications

Activities Deleted	Activities Added	Personal Experience	Open - Ended	Manipulatives	Office Use

C-3

Other Observations

Understanding	Evaluation Methods/ Opportunities	Special Learning Situations	Management	General Impressions	Office Use
	L Q W O	1. Methods	Grouping: W L S P I Materials Handling:		
		2. Needs	Behavior Management:		
			Other:		

APPENDIX D
CALIFORNIA ACHIEVEMENT TESTS (CAT)
LEVEL 12, FORM C SUMMARY STATISTICS
CAT QUESTIONNAIRE

CALIFORNIA ACHIEVEMENT TESTS
SUMMARY STATISTICS

	PMP Students (N=283)	Comparison Students (N=312)
MRT Total Battery (97 items)		
Raw Score Mean	77.05	76.89
Standard Deviation	13.84	12.03
Score Range	25-97	41-97
CAT Computation (26 items)		
Raw Score Mean	21.87	22.10
Standard Deviation	4.391	3.987
Score Range	7-26	2-26
CAT Concepts/Applications (40 items)		
Raw Score Mean	32.25	32.63
Standard Deviation	5.285	4.918
Score Range	14-40	17-40

FAIRFAX COUNTY PUBLIC SCHOOLS
Department of Instructional Services
Office of Research and Evaluation

Primary Mathematics Curriculum Assessment: 1983-84
Teacher's Comments on the California Achievement Tests

We are well aware that a pencil-paper test such as the California Achievement Tests (CAT) cannot measure all the learning that occurs in a classroom. To provide a more complete picture of your student's achievement, please take a few minutes to identify the content and/or learning processes which you feel are not adequately measured by the CAT, Mathematics subtests. Thank you.

Content

Learning processes

Comments